

SPECIAL FORECASTS AND WARNINGS. WEATHER AND CROPS.

WEATHER WARNINGS.

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SPECIAL FORECASTS.

Special forecasts were issued for the national balloon race which was held at St. Louis, Mo., on October 1. The forecast issued on the morning of the 1st was as follows:

Moderate southerly winds at surface, fresh south-southwest winds aloft period. Conditions will become unfavorable for free ballooning late to-night and Thursday, when there will be showers and thunderstorms to the east and north of St. Louis.

A supplemental or final forecast based on special observations was issued at 2:33 p. m. of the 1st and read as follows:

No change from forecast sent this morning. At noon to-day low central over eastern South Dakota. Pressure falling rapidly eastward to the Great Lakes period. Considered inadvisable for balloons to start this afternoon as they will be carried northward toward the Great Lakes, where they will encounter squalls and thunderstorms late to-night and Thursday. Advise it postponed.

In spite of the unfavorable advices given concerning the weather conditions, the pilots were determined to start as indicated in telegram received from the Official in Charge, Weather Bureau Office, St. Louis, which read:

Latest information given to pilots but they are still determined to start at 6 p. m. to-day. Will wire if decision is changed.

The race, in which there were 10 entries, was won by Ralph Upson in the balloon Goodyear, which made a landing near Durlam, Quebec, a distance of 1,020 miles from St. Louis. All contestants were carried north-northeastward toward Lake Michigan, where they encountered thunderstorms and unfavorable weather conditions. One balloon together with its occupants was lost on Lake Huron.

Special forecasts were also furnished twice daily from the 7th to the 31st for the Transcontinental Reliability Race conducted by the United States Army. The route was divided into zones and forecasts for the different zones were sent to the several control stations. The divisions of the route were as follows: Mineola to Cleveland, Cleveland to Chicago, Chicago to Omaha, Omaha to Cheyenne, Cheyenne to Salt Lake City, and Salt Lake City to San Francisco. The forecasts issued the evening of the 9th were as follows:

Salt Lake to San Francisco: Good flying weather, generally clear sky, good visibility, moderate variable winds near the surface probably fresh westerly aloft.

Cheyenne to Salt Lake City: Uncertain flying weather, some clouds, probably snows and poor visibility in the mountains, moderate north and northeast winds near the surface. Upper winds probably south-west and west.

Omaha to Cheyenne: Bad flying weather, low clouds, probably local snows, poor visibility. Fresh and strong northerly winds surface and aloft.

Chicago to Omaha: Rather bad flying weather, clouds, fresh and strong north and northwest winds surface and aloft. Fair visibility.

Cleveland to Chicago: Uncertain flying weather, clouds, occasional showers and probably thunderstorms. Fresh and strong southwest and west winds surface and aloft.

Mineola to Cleveland: Bad flying weather, clouds, showers and squalls. Fair visibility. Strong south and southwest winds surface and aloft.

That these forecasts served a useful purpose and that such are essential to the successful conduct of aerial

navigation is evidenced by an extract from the Air Service news letter of October 25, 1919, as follows:

Lieutenant Maynard's wonderful time was due to the fact that he took advantage of the splendid service rendered by the Weather Bureau in sending the weather forecasts to all of the control stops. If he had been informed that the weather would be bad for the next control stop, he would immediately take off and get to this stop before the storm had approached. This enabled him to gain a distinct advantage over the other participants at the very outset of the race.

Special forecasts were issued daily for the Aerial Mail Service of the Post Office Department and numerous requests for special forecasts were answered.

WASHINGTON FORECAST DISTRICT.

Cold-wave and frost warnings.—On the morning of the 7th frost was reported in upper Michigan, on the following morning in the lake region, the north Atlantic States, in West Virginia, and in portions of the middle Atlantic States, and on the morning of the 9th in the north Atlantic States, warnings for which had been previously issued. On the morning of the 11th warnings for frost were issued for portions of lower Michigan and for temperatures near freezing in upper Michigan, and on the following morning for frost for lower Michigan if weather cleared and for freezing temperatures for upper Michigan. The conditions which occurred justified the advices. On the 12th frosts were forecast for the region of the Great Lakes, the States immediately north of the Ohio River, northern and western Pennsylvania, and the interior of New York and New England. Frosts occurred substantially as indicated in the warnings, except that the weather became cloudy in portions of northern Michigan, thereby preventing the occurrence of frost, and the frost extended into portions of Maryland and West Virginia no warnings for which were issued. On the 16th frosts were forecast for lower Michigan and Indiana and freezing temperatures for upper Michigan, both of which occurred as indicated. On the morning of the 18th frosts occurred quite generally in the upper Ohio Valley, the lower lake region and in the interior of the north Atlantic States, on the morning of the 19th in Pennsylvania, Ohio, and West Virginia, and on the 20th in portions of the lake region, the upper Ohio Valley and the north Atlantic States. The conditions indicated were anticipated in the warnings with the exception of the frosts on the 20th, only a portion of which were forecast. Scattered frosts occurred in Ohio and Indiana on the 22d which were not predicted. Frosts or freezing temperatures occurred on the 29th in Michigan, Indiana, Ohio, and western Pennsylvania, warnings of which had been previously disseminated.

Storm warnings.—On the morning of the 6th storm warnings were ordered on the Atlantic coast from Delaware Breakwater to Eastport but, although fresh to strong winds occurred during the day, no gales were reported. On the afternoon of that date warnings were displayed on the northern portion of the Upper Lakes but again the warnings failed of a general and full verification. On the morning of the 8th warnings were ordered for Lake Superior and the extreme northern

portions of Lakes Michigan and Huron for shifting winds probably reaching gale force off shore, and winds of gale force occurred as indicated. On the evening of the 8th the warnings were extended to cover Lakes Michigan and Huron and on the morning of the 9th were extended to the Lower Lakes and warnings for strong east and southeast winds probably of gale force shifting to northwest were disseminated to ports on Lake Superior. On the 10th the warnings for the Lower Lakes were repeated and the warnings ordered down the evening of that date. Strong winds were reported on all lakes and gales occurred at a number of points. On the evening of the 22d warnings for winds changing to strong northwest by the following morning, with rain changing to snow and much colder weather, were disseminated for western Lake Superior and the conditions indicated occurred practically as indicated. On the morning of the 24th warnings for increasing easterly winds probably reaching gale force with rain and snow were distributed for Lake Superior and at 6 p. m. of the same day were extended to Lakes Michigan, Huron, and Erie. On the morning of the 25th the warnings on Lake Superior were changed to northwest, and southwest warnings were extended to Lake Ontario. Fresh to strong winds with rain or snow occurred generally over the region of the Great Lakes. On the evening of the 27th the following forecast was sent out by radio to vessels on the Great Lakes:

Fresh and strong shifting winds with snow on Lake Superior and rain followed by clearing Tuesday on Lakes Michigan and Huron. Storm of moderate intensity central over Lake Michigan moving northeastward.

During the night winds of gale force occurred on Lakes Michigan, Huron, and Erie. Storm warnings were ordered on the morning of the 28th for Lake Ontario, and information that the winds would diminish at night was disseminated to ports on Lake Erie. Warnings were also ordered the morning of the 28th for the Atlantic coast from Cape Henry, Va., to Eastport, Me., and strong winds and gales occurred over the regions indicated in the advices.

On the afternoon of the 30th storm warnings were ordered on Lakes Superior, Michigan, and Huron, and fresh to strong winds occurred over portions of the Lakes mentioned, but no general gales were reported.

WARNINGS FROM OTHER DISTRICTS.

Chicago Forecast District.—Frost warnings were issued for the Dakotas, eastern Wyoming, and the western portions of Nebraska and Kansas on the 3d and 4th and were partially verified.

On the morning of the 9th a disturbance of marked character was central over Minnesota, while an area of high pressure, accompanied by unseasonably low temperature, was advancing rapidly southeastward over Alberta and Montana, indicating a period of much colder weather for the Chicago forecast district. Accordingly cold-wave warnings were issued for western Minnesota, the eastern and central portions of the Dakotas, southwestern Nebraska, and western Kansas. The warnings were fully verified in the Dakotas only. By the morning of the 10th the crest of the high-pressure area had reached the northern Plains States and warnings of heavy to killing frost were issued for all sections eastward and southward to the limits of the district, except extreme southern Illinois. These warnings were fully verified, except from southeastern Kansas eastward and northeastward over most of Missouri, Illinois, and southeastern Wisconsin, where cloudiness persisted and prevented the formation of frost.

The next warnings were issued on the 16th for the southeastern portion of the district and were fully verified, except in portions of southern Missouri and southern Illinois.

Warnings for the protracted period of unseasonably cold weather in the Northwestern States during the latter part of the month were issued well in advance of the change to colder. In fact, a cold-wave warning was sent to Havre, Mont., on the evening of the 21st when a disturbance was centered immediately to the northward and the sea level pressure was 29.78 inches and the temperature 28° F. The forecast was based principally on the pressure distribution over Alaska, which was favorable for the rapid southeastward advance of a high-pressure area and cold wave over Alberta. By the following morning the barometer had risen to 30.20 inches at Edmonton, with a temperature of 12° F. The cold-wave warnings were then extended to cover all of Montana, North Dakota, and northern Wyoming, and live-stock warnings were sent to the Wyoming and South Dakota stations. During the afternoon and evening cold-wave warnings were issued for South Dakota, Minnesota, western and northern Nebraska, southern Wyoming, and western Kansas, and live-stock warnings for western Nebraska. These warnings were fully verified in Montana and North Dakota, and only partially in the other States on account of the development of a storm of considerable intensity over the northern Plateau Region, with decreasing pressure to the eastward. On the 20th live-stock warnings were issued for Kansas and cold-wave warnings for southwestern Nebraska and northwestern Kansas and Wisconsin. These warnings were not verified, due to the fact that the high-pressure area did not advance southward and eastward as expected.

The last warnings of the month were issued on the 28th, when warnings of heavy frost or freezing temperature were issued for Illinois and southern and eastern Missouri. Killing frost and freezing temperature occurred as predicted in northern Illinois and extreme northern Missouri, but the weather continued cloudy and unsettled to the southward.—*Charles L. Mitchell.*

New Orleans Forecast District.—Frequent heavy rains occurred during the month, rain forecasts being made for Arkansas and Louisiana on 22 dates.

No general storm occurred along the West Gulf coast and no storm warnings were issued.

Cold-wave warnings were ordered on the evening of the 24th for the Texas Panhandle, Oklahoma, and the extreme northwestern portion of Arkansas; the high pressure and cold weather drifted to the eastward instead of moving southward, and while temperatures fell sharply, cold waves did not occur. Cold-wave warnings were ordered on the morning of the 26th for Oklahoma and northern Arkansas, and while there was a sharp fall in temperature, the warnings were not verified.

Frost warnings were issued for northwestern Oklahoma on the 6th; for Oklahoma and the Texas Panhandle on the 10th; for extreme northern Arkansas on the 17th; for Arkansas, Oklahoma, and the northern portion of Texas on the 28th; and for Oklahoma on the 31st. Frost temperatures occurred in several localities. No frosts occurred without warnings.—*I. M. Cline.*

Denver, Colo., Forecast District.—October was notable for the prevalence of moderate anticyclonic conditions in the northern Plateau and Rocky Mountain regions, and correspondingly cool weather in the greater part of this district.

Frost or freezing-temperature warnings were issued for considerable areas in the northern and central parts of the district on the 3d, 4th, 5th, and 6th, owing to the

gradual development of anticyclonic conditions in the northern portions of the Plateau and Rocky Mountain regions. The warnings were justified except in northern New Mexico, where continued cloudiness was unfavorable to radiation and the formation of frost. However, the skies cleared during the night of the 7th-8th, notwithstanding the fact that the barometer fell sharply, and frosts were reported in parts of southwest Colorado and northern New Mexico. An Alberta low of marked intensity extended from northern Arizona northeastward on the morning of the 9th, with a rather steep barometric gradient to the northward. Warnings of freezing temperature were issued for the northern and central parts of the district, with a cold wave in eastern Colorado and southwest Utah. Freezing temperatures occurred as predicted, with a fall in temperature of 15° to 20° F. in eastern Colorado and southwest Utah. Owing to continued moderately high barometric pressure on the northeastern slope, warnings of freezing temperature were issued for parts of eastern Colorado on the 15th and 16th and for frosts in northern New Mexico on the 16th. The warnings were justified. Freezing temperature-warnings were again required in parts of Utah, Colorado, northern Arizona and northern New Mexico on the 18th, 19th and 20th as low barometric pressure prevailed in the district, while an anticyclone from the north Pacific had appeared in British Columbia. The warnings were generally justified. On the morning of the 24th the barometric pressure over the district was low, while the front of an anticyclone had reached southern Montana and the area was overspreading Idaho and Washington. Freezing-temperature warnings were issued for Utah and eastern Colorado. Freezing temperatures occurred as forecast, attended by snow in northern Utah. Warnings for freezing temperature were repeated for Utah on the 25th as the barometric pressure was still low in western Colorado. The front of the anticyclone spread southward to Kansas, blocking the eastward movement of the low. Nevertheless, freezing temperature occurred in Utah. The low moved southeastward to New Mexico on the 27th, followed by rising barometer in the Plateau region, and freezing-temperature warnings were issued for the greater part of the district. Interests

in Colorado were advised as follows: "Much colder weather to-night with temperatures below the freezing point" and in northern New Mexico "Freezing temperature and frost to-night." Temperature fell 15° to 20° F. in parts of Colorado and a killing frost occurred at Santa Fe, N. Mex. One station in the fruit district in Western Colorado reported a temperature of 11°F. above zero.—*Frederick W. Brist.*

San Francisco Forecast District.—On the morning of the 23d a low pressure area was central over Nevada causing rain generally throughout the north Pacific States and the temperatures fell rapidly during the succeeding 24 hours. On the 24th, with a low pressure area over southern Nevada, the rain in the north Pacific States ceased and killing frosts occurred generally throughout eastern Washington, Oregon, and Idaho. This storm caused the first good rains of the season in southern California and on the 24th they extended north to the Sacramento Valley. The low-pressure area moved slowly eastward and on the morning of the 25th it was over Utah.

The high-pressure area over the northern Rocky Mountain States gradually disintegrated, but the cold weather continued in that region, killing frosts being reported on the morning of the 27th in the Puget Sound country.

Near the end of the month a high-pressure area moved from the north Pacific States to the central Plateau States and in doing so caused cold weather in Nevada and northern California. Frost formed in the San Joaquin Valley during this period. The cold weather that overspread the northern portion of the district during the third decade closed the crop season everywhere in the district except in California.

Frost warnings were issued on five days during the first decade for some one or more places in Oregon, Washington, or Idaho, and they were issued on four occasions during the third decade for localities in California.

A southwest storm warning, the first of the season, was issued on the 31st for Washington seaports, which was verified on Puget Sound and partially verified at the mouth of the Columbia River.—*E. A. Beals.*